Fact Sheet

CONTAMINANT-TRANSPORT MODELING FOR RADIOACTIVE WASTE MANAGEMENT IN COLD REGIONS

PROBLEM

The Russian government is developing two technologies to dispose of some of its radioactive wastes:

- Long-term storage of high-level radioactive waste in permafrost rock on the Novaya Zemlya archipelago;
- Concentration of liquid radioactive wastes by freezing.

Appropriate simulation models would be useful for developing and evaluating these candidate radioactive-waste disposal technologies. While there are no models that describe the geochemical and transport behavior of radionuclides in bulk or in frozen ground, recent work by Russian and American researchers indicates that such a model could be developed quickly.

SOLUTION

With funding from the Army Materiel Command and the National Research Council, researchers from the Russian Academy of Sciences and the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) are working together to develop a state-of-the-art three-dimensional model that can simulate the fluxes of water, inorganic solutes and energy in seasonally or permanently frozen ground. The specific goals of the project are to (1) develop a model consisting of chemical-thermodynamic, mass-transfer and energy-transfer submodels, (2) devise a numerical technique for solving boundary problems for the model, (3) investigate soil freezing by key numerical experiments and (4) incorporate the model as the module of FEMWATER, a three-dimensional model of water and solutes through variably saturated ground.

REPORTS AVAILABLE

Marion, G.M. and S.A. Grant (1994) FREZCHEM: A chemical-thermodynamic model for aqueous solutions at subzero temperatures. USA Cold Regions Research and Engineering Laboratory, Special Report 94-18.

Mironenko, M.V., S.A. Grant, and G.M. Marion (1996a) FREZCHEM: A chemical-thermodynamic model for aqueous solutions at subzero temperatures. USA Cold Regions Research and Engineering Laboratory, Special Report 95-18, in review.

Mironenko, M.V., S.A. Grant, and G.M. Marion (1996b) Calculation of densities of electrolyte solutions at subzero temperatures. *Journal of Solution Chemistry*, in review.

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May 1996

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